

hypermedia information itself which is spoken by synthetic speech. Users can explore the workspace with either the keyboard, a joystick or a touchtablet. For the touchtablets, tactile overlays indicate the location of the commands which can then be accessed directly.

[0040] European patent application EP 0 959 445 entitled "Input/Output Tactile Feel Device" (F. J. Tieman B. V.) discloses a Braille device including a plurality of Braille cells that comprise a plurality of pins that are actively positioned to present information to a user via tactile feel.

[0041] The Braille device also allows the user to depress at one or more the pins in order to make a selection analogous to point and click of a mouse. To allow the user to move a screen cursor and make selections via the Braille pins, the Braille cell includes pin position sensing circuitry that senses the position of each of the plurality of Braille pins. A system controller (eg., a CPU) reads the information from the sensing circuitry to determine which pins, if any have been depressed. Advantageously, the Braille pins are used as an output device that allows a user to read information, and also as an input device by allowing the user to depress the Braille pins in order to make a selection

#### OBJECTS OF THE INVENTION

[0042] It is an object of the invention to promote the use of Braille by enhancing the information provided to blind people when reading Braille documents.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0043] The invention will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

[0044] FIG. 1 shows the main components of a preferred embodiment of the present invention, and more particularly a system for identifying a page of a Braille document using a bar code reader.

[0045] FIG. 2 shows a Braille document.

[0046] FIG. 3 shows a particular page of a Braille document according to the present invention.

[0047] FIG. 4 shows the content of a hyperlink table associated with a Braille document according to the present invention.

[0048] FIG. 5 shows a proximity sensing foil placed and aligned under a page of a Braille document according to the present invention.

[0049] FIG. 6 shows how the user is alerted by a sound, a beep, or any other perceptible signal that the item he reads is a hyperlinked item.

[0050] FIG. 7 shows how the user activates a hyperlink by pressing a reserved key on his workstation.

[0051] FIG. 8 shows a system for selecting and accessing Web pages from a Braille document, according to the present invention.

[0052] FIG. 9 shows the method for creating hyperlinks on a Braille document according to the present invention.

[0053] FIG. 10 shows a method for detecting and activating hyperlinks from a Braille document according to the present invention.

[0054] FIG. 11 shows how the proximity sensing foil detects the position of the user's fingertips over a Braille document according to the present invention.

#### DETAILED DESCRIPTION

[0055] The present invention is directed to a system and method to make interactive multimedia information and services linked with items (e.g., words or relief regions) embossed or engraved on physical Braille documents accessible to blind or visually impaired users.

[0056] The invention includes a system and method to enable blind people to detect hyperlinks and to access, from these hyperlinks, multimedia information and/or services located on one or more servers connected to a communication network. An acoustic signal may be used to call the user's attention to hyperlinked items or regions on the physical surface of a Braille document. This signal is activated by the proximity of the user's fingertip.

[0057] The system includes: a proximity sensing foil placed under the page of the Braille document for determining the position of the user's fingertips and for computing its coordinates, and a user system, preferably a personal computer or a workstation, for comparing the position of the user's fingertips over the Braille document with the location of predefined hyperlinked items on the Braille document. An acoustic signals alerts the user when one of his fingertips is detected by the system in the vicinity of a hyperlink. The user can then select and activate this hyperlink and can access the information and/or the service associated with the selected hyperlink.

[0058] While a user is reading a page of a Braille document, a proximity sensing foil placed under the page detects the position of his fingertips and computes the coordinates of the sensed position. These coordinates are sent to the user workstation. The user workstation then computes the distance between the sensed position and the positions of the hyperlinks defined on this page. The coordinates of hyperlinks are stored in a hyperlink table during an initial phase. If the computed distance between the sensed position and a particular hyperlink on the hyperlink table is smaller than a predetermined minimum value, it is concluded that user's fingertips are positioned over the corresponding hyperlink. The user workstation then alerts the user by an acoustic signal or any other perceptible signal that a hyperlink is associated with the item. The user can then choose to activate this hyperlink by any means (e.g., by pressing a special key on the user workstation). When the user activates the detected hyperlink, the user workstation identifies, in the same hyperlink table, a server, and, within this server, the information and/or the service associated with the detected hyperlink. Finally, a request is sent to the identified server for accessing the desired information and/or service.

[0059] In an illustrative embodiment, the user workstation is connected to the Internet, and comprises a Web Browser application. Servers are Web servers, and the information or/and the service may be Web pages linked to the items embossed or engraved on the Braille document.

[0060] FIG. 1 illustrates the system according to a preferred embodiment of the present invention. A Braille docu-